

### **REMARKS**

In response to the restriction requirement dated October 18, 2007, claims 1-16, 18-22, 24-32, 34-73 were withdrawn and therefore canceled. Claims 17, 23, 33, 96 and 97 have been amended. New claim 98 has been added for consideration. Support for the amendments to claims 17, 23, and 33 can be found in the specification as filed, for example, paragraphs [0033], [0074] and [0157] to [0166]. Support for new claim 98 may be found in original claim 23. Claims 17, 23, 33 and 74-98 are currently pending.

In the Office Action dated October 20, 2008, the Examiner has withdrawn: the previous objection to claim 33, the rejections under 35 U.S.C. 2<sup>nd</sup> paragraph to claim 78 and his prior rejection under 35 USC § 101 to claims 17, 23, 33 and 74-95. Applicant thanks the Examiner for the withdrawal of the aforementioned objection and rejections.

### **Summary of Personal Interview Conducted on December 16, 2008**

In accordance with the provisions of 37 CFR 1.133, Applicant herein makes of record the substance of the personal interview conducted on December 16, 2008, between Applicant Andrew Hecht, Applicant's attorneys: Felix D'Arienzo and Sunil Raval, and Primary Examiners Ed Baird and Jessica Lemieux and Supervisory Patent Examiner Jay Kramer.

During the interview, the pending claims were discussed in view of rejections made in the Office Action dated January 19, 2007. Specifically, the teachings of the Florance reference (U.S. Publication No. 2002/0065739) as cited in the Office Action dated January 19, 2007 were discussed in view of the pending claims. Applicants note the Examiner's suggestion to further show how the daily cash index is generated and how a "daily" index is unique and non-obvious.

No agreement with respect to the claims was reached.

Applicants thanks the Primary Examiners and Supervisory Examiner for agreeing to the personal interview, and respectfully requests that the substance of interview be made of record.

### **Claim Objection**

Claim 97 was objected to for informalities. Claim 97 has been amended to correct the spelling of the word "hectare". Applicants note that claim 96 has also been amended to correct the spelling of the word "hectare".

Withdrawal of the objection to claim 97 is therefore respectfully requested.

Claim Rejections- 35 USC §103

Claims 17, 23, 33, 78-81, 86, 91, 92, and 95 were rejected under 35 U.S.C. 103(a) as being unpatentable over Florance, et al (U.S. Publication No. 2002/0065739) in view of Kevenides ("International Real Estate Investment Risky Analysis," Real Estate Issues, Chicago: Fall 2002. Vol. 27, Issue 3/4; pg. 61, 13 pgs), in further view of Rothstein et al (US Patent No. US 6,058,369).

The Florance et al. patent (U.S. Publication No. 2002/0065739) describes "a system and method for creating a unified commercial real estate data model through collection, distribution and use of information in connection with commercial real estate and a web-based marketplace that facilitates the buying and selling of commercial properties." See Florance, page 3, paragraph [0036].

The Kevenides publication describes "three approaches to calculating value at risk." See Kevenides, page 3, full paragraphs 3 to 5.

Applicant notes that claims 17, 23 and 33 have all been amended in accordance with the Examiner's suggestion during the December 16, 2008 personal interview to further show how the daily cash index is generated.

**Claim 23:**

Independent claim 23 of the present invention, as amended, recites:

23. A method for providing a daily cash index for real estate transaction values, comprising:

- a. for each day, performing a survey of actual real estate transactions executed on said day in a local region;
- b. for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value.

Applicants respectfully submit that the Florance patent describes “a system and method for creating a unified commercial real estate data model through collection, distribution and use of information in connection with commercial real estate and a web-based marketplace that facilitates the buying and selling of commercial properties”, however, the Florance patent does not disclose “a method for providing a daily cash index for real estate transaction values” as recited in independent claim 23 of the present invention. Specifically, the Florance patent does not show or teach “generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value” as currently recited in amended claim 23. As previously asserted, Applicants respectfully submit that although the Florance patent describes a system of data collection and distribution, Florance does not describe generating a daily cash index as recited in claim 23 of the present invention. Building and updating a database as described in the Florance patent is not utilization of the information maintained in a database to generate an index on a daily basis. As the building and updating of a database is not “generating a daily cash index”, Applicants respectfully submit that the Florance patent does not in any way show or teach “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value” as recited in independent claim 23 of the present invention.

The Office Action asserts that:

[r]egarding claims 17 and 23, Florance teaches...generating a daily cash index of real estate transaction values in the local region based upon the survey, the daily cash index

being expressed as a price per unit and usable as a daily settlement value in a real estate based securities market [see paragraph 0052]-clients receive daily service updates; paragraph 0105. Examiner interprets creation of indexes as similar to Applicant's generating a daily cash index]  
See Office Action, page 5, second and third full paragraph.

Applicant respectfully submit that paragraphs [0052] and [0105] of the Florance patent state:

[0052] The system uses linked databases and computers to provide a wide array of digital service offerings including a leasing marketplace, a selling marketplace, decision support, tenant information, comparable sales information, property marketing, and industry news. All of these services are preferably digitally delivered and most clients receive daily service updates over the Internet.

[0105] The invention also provides a method and system for listing and brokering a commercial real estate and its financial derivatives. In particular, the system of the present invention can be used in connection with the creation of financial derivatives for commercial real estate. To create these derivatives, one must have a source of comprehensive information. The system of the present invention supports derivatives for commercial real estate by providing sufficiently accurate market information that supports the creation of indexes and derivatives such as futures or hedge rental rates and occupancy rates. The system can also be used for underwriting and rating commercial mortgage banking securities.

Applicants respectfully submit that there is no support that the "daily service updates over the Internet" as described in paragraph [0052] of the Florance patent is in any way a teaching of the generation of "for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value" as recited in claim 23 of the present invention. The daily service updates of the Florance patent appear to merely relate database updates in support of a "wide array of digital service offerings including a leasing marketplace, a selling marketplace, decision support, tenant information, comparable sales information, property marketing, and industry news" as described in paragraph [0052] of the Florance patent. However, none of "a leasing marketplace, a selling marketplace, decision

support, tenant information, comparable sales information, property marketing, and industry news” as described in Florance is a “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value” as recited in claim 23 of the present invention. Therefore, the assertion in the Office Action that regarding claims 17 and 23, that the daily service updates as described in Florance are equivalent to the daily cash index as recited in claim 23 of the present invention is unsupported. The Florance patent does not show or teach “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value” as recited in claim 23 of the present invention.

The Florance patent describes a data collection and distribution system that “supports derivatives for commercial real estate by providing sufficiently accurate market information that supports the creation of indexes and derivatives such as futures or hedge rental rates and occupancy rates.” See Florance, paragraph [0105]. Applicants respectfully submits that the data collection and distribution system that “**supports** derivatives for commercial real estate” is not “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value” as recited in claim 23 of the present invention.

Moreover, as asserted in the previous Response to Office Action, Applicants maintain that the known indices prior to the present invention were generated and calculated on a monthly

basis, e.g. S&P/Case-Shiller® Home Price Indices.

Therefore, Applicant respectfully submits that the state of the art at the time of the present invention was to calculate monthly indices as in the Case Shiller Indices and not “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey” as recited in independent claim 23 of the present invention.

Lastly, Applicant reasserts that a benefit of generating a daily cash index is the ability to fix and settle derivative positions on a daily basis thus providing for fluidity in the financial marketplace. Applicants previously made of record a review entitled “Morgan Stanley: Property Derivatives Insights: Pure Play on residential Realty” which was published by a financial services provider which discusses a commercial embodiment of the present invention, the “Residential Property Index (“RPX”), which is presently marketed by the Applicant.

Applicant asserts that the Rothstein patent does not cure the defect of either the Florance patent or the Kevenides reference as Rothstein does not describe “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value” as recited in claim 23 of the present invention, nor is it asserted by the Office Action that Rothstein does so.

For the foregoing reasons, withdrawal of the Examiner’s rejection of independent claims 17, 23 and 33 and dependent claims 78-81, 86, 91, 92, and 95 is respectfully requested.

#### Claims 17 and 33

Independent claims 17 and 33 of the present invention, as amended, recite:

17. A method for providing a daily cash index for real estate transaction values, comprising:

- a. for each day, performing a survey of actual real estate transactions executed on said day in a local region;
- b. for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of

actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value;

- c. for each month, aggregating the daily surveys to generate a monthly cash index;
- d. generating a volatility value based upon the monthly cash indices over at least one year as a measure of historical performance.

33 A method for providing a daily cash index for real estate transaction values, comprising:

- a. based upon historical data, generating monthly cash indices of real estate values in a local region for each month of at least 10 prior years;
- b. generating an initial volatility value based upon the monthly cash indices over said at least 10 prior years;
- c. for each day, performing a survey of actual real estate transactions executed on said day in the local region;
- d. for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value;
- e. for each month, aggregating the daily surveys on a monthly basis to generate a monthly cash index for said each month; and
- f. updating the volatility value based upon each monthly cash index generated in step e.

As discussed above, the Florance patent describes a system and method for creating a unified commercial real estate data model through collection, distribution and use of information

in connection with commercial real estate and a web-based marketplace that facilitates the buying and selling of commercial properties. The Kevenides publication describes three approaches to calculating value at risk. However, neither the Florance patent nor the Kevenides publication disclose “a method for providing a daily cash index for real estate transaction values” as recited in independent claims 17 and 33 of the present invention. As discussed above with respect to claim 23, the Florance patent describes a system of data collection and distribution which is not “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value” as also recited in independent claims 17 and 33 of the present invention.

Kenevides describes the concept of calculating and analyzing Value At Risk (VAR). Kenevides describes that “Value at Risk (VAR) is the amount of money an institution could make or lose from changes in the price of the underlying assets.” See Kenevides, page 2, first full paragraph under the section heading “CALCULATING AND ANALYZING VALUE AT RISK”. Kenevides describes that “the VAR concept incorporates two central elements of risk: (1) the sensitivity of a portfolio to changes in underlying prices and (2) the volatility of the underlying prices. See Kenevides, page 2, first full paragraph under the section heading “CALCULATING AND ANALYZING VALUE AT RISK”. The Kenevides publication describes three approaches to calculating value at risk (VAR): 1) the correlation method; 2) the historical simulation approach and 3) the Monte Carlo simulation method.

None of the three approaches described in the Kenevides publication teach or show “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value” as recited in claims 17 and 33 of the present invention. In the present invention, the monthly cash indices is being generated as an aggregate of the daily cash



indices. As the Kenevides publication fails to teach or show generating a daily cash index of real estate transaction, Applicant respectfully submits that the Kenevides also fails to teach or show “generating a volatility value based upon the monthly cash indices over at least one year as a measure of historical performance” as recited in claim 17 of the present invention. Kenevides also fails to teach or show “for each month, aggregating the daily surveys on a monthly basis to generate a monthly cash index for said each month; and d. updating the volatility value based upon each monthly cash index generated in step e” as recited in claim 33 of the present invention. Therefore, Kenevides fails to cure the defect of the Florance patent as described above.

Applicant asserts that the Rothstein patent does not cure the defect of either the Florance patent or the Kenevides reference as Rothstein does not describe “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value” as recited in claim 23 of the present invention, nor is it asserted by the Office Action that Rothstein does so.

For the foregoing reasons, withdrawal of the Examiner’s rejection of independent claims 17 and 33 and dependent claim 91 is respectfully requested.

**Rejection of claims 74, 75, 77, 82, 83, 85, 87, 88, 90, 93, 94, 96 and 97**

Claims 74, 75, 77, 82, 83, 85, 87, 88, 90, 93, 94, 96 and 97 were rejected under 35 U.S.C. 103(a) as being unpatentable over Florance, et al (U.S. Publication No. 2002/0065739) in view of Kenevides (“International Real Estate Investment Risky Analysis,” Real Estate Issues, Chicago: Fall 2002. Vol. 27, Issue 3/4; pg. 61, 13 pgs.) in further view of Rothstein as applied to claims 17, 23, and 33 and further in view of Official Notice.

The Florance patent, Kenevides publication and the Rothstein patent are discussed above with respect to independent claims 17, 23 and 33.

In view of the comments above with respect to independent claims 17, 23 and 33,

withdrawal of the rejections to dependent claims 74, 75, 77, 82, 83, 85, 87, 88, 90, 93, 94, 96 and 97 under §103(a) is respectfully requested.

**Rejection of claims 76, 84 and 89**

Claims 76, 84, and 89 were rejected under 35 U.S.C. 103(a) as being unpatentable over Florance, et al (U.S. Publication No. 2002/0065739) in view of Kevenides (“International Real Estate Investment Risky Analysis,” Real Estate Issues, Chicago: Fall 2002. Vol. 27, Issue 3/4; pg. 61, 13 pgs.) in further view of Rothstein as applied to claims 17, 23, and 33 above, and further in view of Hoadley (“Options Strategy Analysis Tools”, website [www.hoadley.net/options/BS.htm](http://www.hoadley.net/options/BS.htm). December 18, 2002.

The Florance patent, Kenevides publication and the Rothstein patent are discussed above with respect to independent claims 17, 23 and 33.

The Hoadley reference describes an Options Strategy Evaluation Tool which “enables you to construct and evaluate various strategies made up of combination of trades in puts and calls plus trades in the underlying asset.” See Hoadley, page four, second full paragraph under section heading “Options Strategy Evaluation”.

As Hoadley does not teach or show “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey by compiling the data obtained from the survey of actual real estate transactions into a series of data points; for each day, manipulating the series of data points by statistical tools to create a normal distribution of rate prices per unit area; and for each day, calculating the price per unit area for the local sector; the price per unit area for the local sector being usable as a cash mark to market settlement value” as recited in claims 17, 23 and 33 of the present invention, the Hoadley reference fails to cure the defect of the Florance patent, Kenevides publication or the Rothstein patent as discussed above.

In view of the comments above with respect to independent claims 17, 23 and 33, withdrawal of the rejections to dependent claims 76, 84, and 89 under §103(a) is respectfully requested.

New Claim 98:

New claim 98 recites:

A method for providing a daily cash index for real estate transaction values, comprising:

- a. for each day, performing a survey of actual real estate transactions executed on said day in a local region;
- b. for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey, the daily cash index being expressed as a price per unit and usable as a daily settlement value in a real estate based securities market.

As submitted with respect to independent claims 17, 23 and 33 above, Applicants respectfully submit that the Florance patent, as cited in the Office Action dated October 20, 2009, describes “a system and method for creating a unified commercial real estate data model through collection, distribution and use of information in connection with commercial real estate and a web-based marketplace that facilitates the buying and selling of commercial properties”, however, the Florance patent does not disclose “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey, the daily cash index being expressed as a price per unit and usable as a daily settlement value in a real estate based securities market” as recited in new claim 98 of the present invention. Applicants respectfully submit that the Florance patent describes a system of data collection and distribution. Building and updating a database as described in the Florance patent is not utilization of the information maintained in a database to generate an index on a daily basis as recited in claim 98. As the building and updating of a database is not “for each day, generating a daily cash index”, Applicants respectfully submit that the Florance patent does not in any way show or teach “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey, the daily cash index being expressed as a price per unit and usable as a daily settlement value in a real estate based securities market” as recited in independent claim 98 of the present invention.

Applicants respectfully re-iterate that there is no support that the “daily service updates over the Internet” as described in paragraph [0052] of the Florance patent is in any way a teaching of the generation of “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey, the daily cash index being expressed

as a price per unit and usable as a daily settlement value in a real estate based securities market” as recited in claim 98 of the present invention. As submitted with respect to claims 17, 23 and 33, the daily service updates of the Florance patent appear to merely relate database updates in support of a “wide array of digital service offerings including a leasing marketplace, a selling marketplace, decision support, tenant information, comparable sales information, property marketing, and industry news” as described in paragraph [0052] of the Florance patent. However, none of “a leasing marketplace, a selling marketplace, decision support, tenant information, comparable sales information, property marketing, and industry news” as described in Florance is a “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey, the daily cash index being expressed as a price per unit and usable as a daily settlement value in a real estate based securities market” as recited in claim 98 of the present invention.

The Florance patent describes a data collection and distribution system that “supports derivatives for commercial real estate by providing sufficiently accurate market information that supports the creation of indexes and derivatives such as futures or hedge rental rates and occupancy rates.” See Florance, paragraph [0105]. Applicants respectfully submits that the collection and distribution of data for a database is not “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey, the daily cash index being expressed as a price per unit and usable as a daily settlement value in a real estate based securities market” which may be used to fix and settle cash derivative positions in a financial marketplace.

Moreover, the known indices prior to the present invention were generated on a monthly basis. Applicant refers to a publication entitled “S&P/Case-Shiller® Home Price Indices”, a copy of which is attached to this Response as Appendix 1. Applicant notes that the S&P/Case-Shiller Home Price Indices are calculated monthly. See Appendix 1, “S&P/Case-Shiller® Home Price Indices”, second full paragraph.

Therefore, Applicant respectfully submits that the state of the art at the time of the present invention was to calculate monthly indices as in the Case Shiller Indices and not “for each day, generating a daily cash index of real estate transaction values in the local region based upon the survey” as recited in independent claim 23 of the present invention.

The benefit of generating a daily cash index is the ability to fix and settle derivative

positions on a daily basis thus providing for fluidity in the financial marketplace. This is evidenced in a review entitled “Morgan Stanley: Property Derivatives Insights: Pure Play on residential Realty” which was published by a financial services provider which discusses a commercial embodiment of the present invention, the “Residential Property Index (“RPX”), which is presently marketed by the Applicant. A copy of the review entitled “Morgan Stanley: Property Derivatives Insights: Pure Play on residential Realty” is attached to this Response as Appendix 2. As noted in the attached review which compares RPX to other housing indices generated on a monthly basis, including the Case-Shiller Home Price Index, RPX:

[r]epresents daily transactions from 25 U.S.metropolitan statistical areas on a price per square foot measure. In our view, RPX emerges as the best tradable index among the different alternatives.”

See Morgan Stanley: Property Derivatives Insights: Pure Play on residential Realty, page 1, section “RPX Has Arrived”.

Applicant also respectfully directs the Examiner’s attention to the Declaration of Andrew T. Hecht, attached herewith as Appendix 3, which states:

[t]he novelty and non-obvious nature of the method disclosed in the present application is that the methodology creates a **daily price** (spot price or cash market price) **per metric** (i.e., per square foot, per square meter, per acre and so on), which is used as a basis for risk positions in various sectors of the real estate market. The importance of the daily (spot) price is three fold:

1. **Benchmarking**- a daily price provides real estate market participants the ability to market-to-market risk positions and establish a forward curve. Using the daily price as a spot market and using the forward perception of prices traded by the real estate market as established by forward, future or option real estate derivative prices, the difference of the spot price and forward prices yields a “basis” (Spot price - Forward Price= Basis). This “basis” is central to establishing financial risk with respect to real estate. The transparency of a daily price is central to promoting market confidence and viability.
2. **Trading and Analytics**- the daily price for real estate is key in understanding the volatility of the underlying markets and the approach taken in the patent application was novel in that all other indexes established, while they might have data that is collected on a daily basis, they have always been issued and disseminated on a monthly or quarterly basis.
3. **Derivative instruments**- the daily price is the key cog in the success of derivative market instruments created as a result of the methods described in the patent applications.

Applicant also respectfully notes that the Declaration of Andrew T. Hecht states:

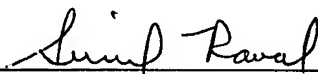
Calculating the daily cash index price is significant because it allows for the opportunity for a transparent benchmark for the daily mark-to-market of risk positions and creation of a forward curve based on future perception of the market in relation to these daily prices. This concept was never before applied to the real estate markets and without a daily price a trader or one who has risk in real estate would be taking that risk in the blind and would only have monthly or quarterly prices to gauge their returns and risks.

For the foregoing reasons, Applicant respectfully submits that new claim 98 is patentable over the prior art previously cited in the Office Action dated October 20, 2008.

CONCLUSION

The present application is respectfully submitted as being in condition for allowance and applicants respectfully request such action.

Respectfully submitted,  
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# APPENDIX 1

The McGraw-Hill Companies

**STANDARD  
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& POOR'S**

## Indices

### S&P/Case-Shiller® Home Price Indices

[Overview](#)[Index](#)[News](#)[Data](#)

#### Description

The S&P/Case-Shiller® Home Price Indices measures the residential housing market, tracking changes in the value of the residential real estate market in 20 metropolitan regions across the United States. These indices use the repeat sales pricing technique to measure housing markets. First developed by Karl Case and Robert Shiller, this methodology collects data on single-family home re-sales, capturing re-sold sale prices to form sale pairs. This index family consists of 20 regional indices and two composite indices as aggregates of the regions.

The S&P/Case-Shiller Home Price Indices are calculated monthly and published with a two month lag. New index levels are released at 9am Eastern Standard Time on the last Tuesday of every month.

In addition, the S&P/Case-Shiller® U.S. National Home Price Index is a broader composite of single-family home price indices for the nine U.S. Census divisions and is calculated quarterly.

Note: The S&P/Case Shiller Indices are calculated by Fiserv, Inc. In addition, Fiserv also offers indices covering thousands of zip codes and metro areas using the Case-Shiller methodology. For more information, please call 877-279-2272.

#### Index Governance and Policy

This index is maintained by an Index Committee, whose members include Standard & Poor's, Fiserv and leading industry experts. It follows a set of published guidelines and policies that provide the transparent methodologies used to maintain the index.

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[Related Information:](#)[Web Casts](#)**March 25, 2008**[Web Cast Presentation](#)[Dr. David Blitzer](#)[Downloadable Podcast  
\(QuickTime required\)](#)[S&P/Case-Shiller® Indices \(audio only 47:01\)](#)**November 27, 2007**[Web Cast Presentation](#)[Professor Robert Shiller and Dr. David Blitzer](#)[Downloadable Podcast  
\(QuickTime required\)](#)[The Current and Future State Of The](#)



Learn More

S&P/Case-Shiller® Home Price Factsheet

S&P/Case-Shiller® Home Price Indices Methodology

S&P/Case-Shiller® Home Price FAQ

February 26, 2008: S&P/Case-Shiller® U.S. National Home Price Values

April 29, 2008: Historical Values

April 29, 2008: S&P/Case-Shiller® Indices sale pair counts

April 29, 2008: S&P/Case-Shiller® Indices tiered price indices

April 29, 2008: (Mirror Site)

U.S. Housing Industry  
(audio only 47:01)

Related Indices

The S&P/GRA Commercial Real Estate Indices (SPCREX™) are designed to be a reliable and consistent benchmark for commercial real estate prices in the United States.

S&P/GRA

Commercial Real

Estate Indices

(SPCREX™)

# APPENDIX 2

September 21, 2007

Structured Credit

## Property Derivatives Insights

### Pure Play on Residential Realty

**Historically, Limited Avenues for Expressing Direct Views on Housing:** While there are a host of alternatives, they represent indirect measures of housing market trends and are for the most part, long only – not direct investments in housing, and largely devoid of geographic specificity. The advent of residential property derivatives trading as a pure play on housing is a big step towards alleviating this constraint.

**RPX Has Arrived:** Radar Logic Incorporated has launched the Residential Property Index from which futures, total return swaps, and other products can trade. It represents daily transactions from 25 U.S. metropolitan statistical areas on a price per square foot measure. In our view, RPX emerges as the best tradable index among the different alternatives. We describe RPX index mechanics and compare it with other indices of home prices. We also briefly describe the workings of the RPX total return swap.

**Housing Is Not Always a One-Way Trade:** Although at the national level, home prices have generally grown each year, there were pockets of the market that lost money from time to time. Dispersion of annual returns is wide, even in good years. Therefore, there could be many relative-value plays among different geographical areas.

**Who Could Play in Housing:** We think RPX based property derivatives offer long and short opportunities for a wide range of investors – hedge funds, asset managers, mortgage loan originators/servicers and home builders/developers. They offer diversification benefits to enhance returns as well as help manage risks. Ultimately, RPX provides an efficient way to express strong views on residential housing.

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Please see additional important disclosures at the end of this report.

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## Property Derivatives Insights

### Pure Play on Residential Realty

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Everyone loves to talk about residential real estate, but expressing investment views directly on real estate from a long/short relative value perspective has always been challenging. At an individual level, the conventional wisdom was and still is simply to buy a house. Then trade up to a bigger house, and maybe make that house bigger still. Institutional investors' avenues for residential real estate exposure are much varied – ranging from investing in real estate funds, mortgages-backed securities, and stocks of homebuilders and mortgage lenders. A few aspects of these different ways to invest in real estate are worth noting. They are for the most part, long only; not all are direct investments in housing,<sup>1</sup> and they are largely devoid of geographic specificity. Thus, it is difficult to express investible views that exploit regional differences in housing markets.

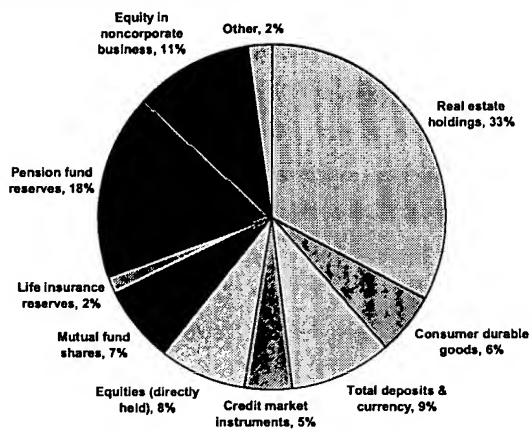
Property derivatives trading seeks to address these gaping holes in the investment opportunity set for institutional investors. In this report, our first under this new flagship publication, we briefly introduce the backdrop of real estate in the U.S., explain the development of alternative housing indices, and focus on one, the Residential Price Index (RPX), which we expect to be the index on which many property derivatives will trade in the OTC market. With the rollout of RPX-based trading launched this week, we think it is important for all interested investors to understand the mechanics of residential home price indices and the specifics of historical housing performance to be able to effectively use these new products (and other upcoming ones).

#### Housing Matters

Since 1965, homeownership percentages have climbed from 63% to 68%,<sup>2</sup> despite a dip in the 1985-1995 period. Thus, the nation's psychology, status, and infrastructure (not to mention tax policy) has increasingly favored homeownership over time. Consequently, real estate constitutes the single largest asset in the portfolios of the US household (Exhibit 1).

<sup>1</sup>Other factors besides the value of homes can influence their performance.  
<sup>2</sup>U.S. Census.

Exhibit 1  
**Largest Slice Deserves Much Attention**



Source: Federal Reserve

The increase in mortgage applications and decline in interest rates combine to showcase the attractiveness of real estate buying and investing in the long run. Despite the tremendous growth in house prices, affordability has been maintained and only recently has shown signs of dipping.<sup>3</sup> Median incomes have more than kept up pace to support monthly mortgage payments on the median house. Given this landscape, the importance of tradable residential real estate instruments is even more salient.

On the other hand, sub-prime related shocks continue to reverberate across the global financial system, far beyond the mortgage-backed securities and related structured products. While we think that the poor performance of recent sub-prime collateral pools is largely a result of lenient lending standards, the recent slowdown in home prices has not helped. As such, there has been an investor need to short housing.

Up until now, there was no direct tradable instrument to express views on residential real estate other than buying up large tracts of real estate (with no way to go net short). Obviously, such an investment that would require a large commitment in maintenance, taxes, and complicated unwinds. However, the current opportunity set offers, at best, indirect bets on housing.

<sup>3</sup>Housing Affordability Composite Index, National Association of Realtors.

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## The Alphabet Soup of Indirect Housing Bets: ABS, ABS CDO, ABX and TABX

As noted earlier, a popular financial avenue to go long housing risk has been either through stocks related to the residential real estate sector (e.g., REITs) or by buying securities that are backed by residential mortgages of various types. ABS CDOs were another means of going long leveraged exposure to real estate. The latter took off in a big way since early 2003; we estimate the outstanding ABS CDO market to be in the \$550-600 billion range.

The advent of CDS on ABS through standardized documentation in July 2005 marked a significant new development: it opened up an attractive method for investors to go both long and short ABS risk. CDS on CDOs was a subsequent development essentially along similar lines. Macro hedge funds and others have used ABS CDS and CDS on CDOs as well as standardized indices like ABX and TABX to express strong negative views on sub-prime housing credit, with varying degrees of success.

We reiterate the indirect nature of the housing bet embedded in these instruments, whether going long or short. While home prices are undoubtedly integral to the performance of ABS and ABS CDO securities, several other pertinent factors come into play. Structural features unique to ABS and ABS CDOs (e.g., triggers, turbos, step-down, cash flow waterfall, over-collateralization spread, etc.) have substantial influence on their performance. The mortgage pools underlying ABS are, by definition, large geographically well-dispersed pools. Even though certain states like California and Florida dominate in many ABS pools, their weights are still too low to achieve desired geographic specificity. Further, ABS CDOs are typically managed pools with a CDO manager. Thus, security selection and trade timing have a significant impact on CDO performance. Finally, ABS CDOs involve sub-prime ABS and reflect only that residential segment. This is true also of ABX, TABX, and more generally ABS CDS – all pertaining to the sub-prime sector only, not the general housing sector.

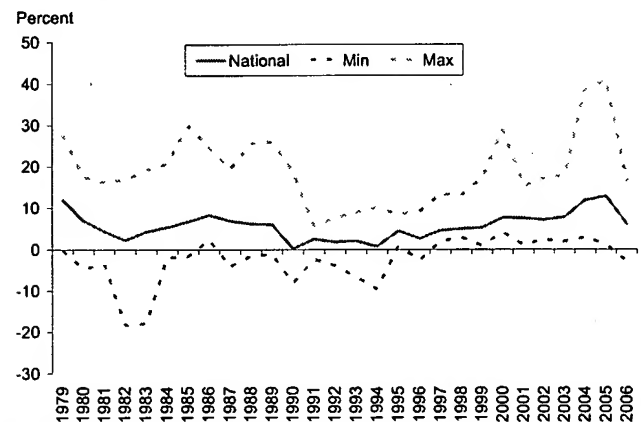
This alphabet soup was an imperfect and leveraged way to spell out “real estate.” An instrument whose performance mirrors only residential real estate prices would be better. However, given that homes are disparate assets (even in cookie-cutter neighborhoods), we need standardized indices whose performance is tied solely to home prices and are geographically controlled.

One simple way to see geographic variation is to look at the histories of the OFHEO (Office of Federal Housing Enterprise Oversight) HPI (Home Price Index) for multiple cities in the

U.S. (more about this particular index and city selection in a later section). The dotted lines in Exhibit 2 display the maximum and minimum metropolitan area returns experienced each year. Thus, the regional differences are quite significant, even in very strong periods.

Exhibit 2

### Housing Returns: A Range of Differences



Source: Office of Federal Housing Enterprise Oversight

### The Indexation Problem

First, we take a step back. There are three well-known requirements of a good value index: (1) consistent pricing, (2) comprehensive coverage and (3) being rules-based. To that end, we can safely say that any real estate index cannot fully satisfy all three requirements. Since not all houses trade regularly, we can never really have consistent pricing over time. For the small subset that does trade, there are lengthy settlement times (from agreement to closing), reporting delays (from closing date to public disclosure), and likely human recording errors. Due to small sample size, we cannot have deep coverage.<sup>4</sup> Therefore, no matter what set of rules an index uses, every index will have some limitations.

What we end up with in all cases is usually a home sales price index on a representative segment. The index, however, cannot measure missed sales, contemplated transactions, or delaying tactics. We do however believe that the law of large numbers<sup>5</sup> does not need much policing. If smaller homes are more in vogue, that *should* be reflected in the price action. The same holds true for foreclosures, renovations, job displacements and socio-economic shifts. If an impact is truly

<sup>4</sup>By comparison, the investment grade credit indices generally include half of all bonds outstanding.

<sup>5</sup>The law of large numbers states that the population average converges to its true mean as sample size increases.

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isolated, its inclusion should not matter. If an effect is more common, the published index should reflect that trend. Luckily, this also makes index construction and maintenance much easier.

### Enter the RPX

RPX was created by Radar Logic Incorporated. Begun in 2003 as Global Skyline, the company evolved into its current form via joint partnerships with Ventana Systems and Miller Samuel. RPX measures housing value in terms of *price per square foot*, or ppsf.<sup>6</sup> Perhaps the typical homeowner never thinks in terms of ppsf, but there are situations where it becomes quite common and eminently helpful. For example, New York City has many small apartments where slight differences in size can cause huge swings in selling price. Architects and builders also often use ppsf to quote construction costs. Ultimately it is an excellent way to consolidate and compare vastly different sized property on a more even (*square*) footing. Mansions can coexist with studio apartments on a more common playing field, though on potentially different parts of that distribution. Using this 'normalized' index adjusts for homes that have been enlarged in the recent renovation boom, though it may not reflect an upgrading to a gourmet kitchen.

Land acreage can only indirectly affect this pricing measure: two identical houses on different sized lots would have vastly different ppsf values. The extra land would only serve as a "feature" to potentially enhance the walls and floors; it would not explicitly enter calculations. Different municipalities may also have varying rules regarding square footage measurement. There are no adjustments made to each district's official size numbers.

RPX includes covers 25 Metropolitan Statistical Areas (MSAs) – major urban centers used for housing price determinations<sup>7</sup> and a nationwide composite. This composite uses fixed published weights of the underlying MSAs, with periodic rebalancing (2-3 years) using official census and proprietary data. The index incorporates all residential real estate transactions that take place on that day. This includes existing *and new* condominiums, stand-alone houses, and multi-family homes. Each sale is converted into a ppsf using publicly available data. All closed (i.e., completed) transactions are then fitted to a multi-parameter distribution

with the resulting median becoming that day's index level.<sup>8</sup> Foreclosures and short-term "flips" are included, but certain non-arm's-length exchanges are eliminated. Every transaction is equally weighted. If a particular region experienced significant anomalous sales, that would be captured in that market's index value.

### Case-Shiller Indices

Of all other residential housing indices, the most well known are the S&P/Case-Shiller (SPCS). These were originally developed to cover 20 MSAs and two composites.<sup>9</sup> SPCS relies on repeat-sales observations on single-family houses; it does not include new home or condominium sales. It also screens out non-arm's-length and severe outlier transactions – thus it potentially filters out properties with major remodels at the upper end and foreclosures at the lower end. Case-Shiller market-weights each sale and also weights transactions (inversely) by the length of time between transfers. Short-term 'flips' are disallowed.

Exhibit 3

### How RPX Compares to SPCS

Index	RPX	SPCS
Provider	Radar Logic	MacroMarkets
# MSAs	25	10 or 20
History Inception	2000	1987
Exchange	None	CME
Traded Beginning	Sept 2007	May 2006
Longest Contract	5 Year (Qtrly Cycle)	5 Year (Annual Cycle)
Frequency	Daily	Monthly
Lag or Lookback	63 Days	2 Months
Data Collection Period	1-, 7-, or 28-Days	3 Months
Underlying Concept	Distribution Fitting	Repeat Sales
New Sales	Included	Not Included
Condominiums	Included	Not Included
Foreclosures	Included	Potentially Filtered
Non-Arm's-Length Trade	Not Included	Not Included
Home Holding Period	No Minimum	6 Months Minimum
Transactions Weighted	Equally Weighted	Less for Longer Holding
Additional Filters	Suspected Data Error Missing Data	Suspected Data Error Changed Property Type Substantial Physical Change

Source: Radar Logic, MacroMarkets, Morgan Stanley

This index is traded in derivative form on the Chicago Mercantile Exchange (CME) and has seen about \$350MM in traded notional from its May 2006 inception through June 2007.<sup>10</sup> While contracts were limited to one-year expirations, it should see expansions to five-year contracts around the same

<sup>6</sup>The Radar Logic Index Methodology, Radar Logic, 2007. Data available at [www.radarlogic.com](http://www.radarlogic.com).

<sup>7</sup>The Office of Management and Budget, or OMB established MSA definitions.

<sup>8</sup>The shape is determined using 365 days of data, but the median just uses 1 day's data at that assumed shape. Please see The Radar Logic Daily Index (White Paper), Ventana Systems, Inc., Kagarlis, Marios et al. March 28, 2007.

<sup>9</sup>S&P/Case-Shiller Home Price Indices, Standard & Poor's, February 7, 2007. Data is available at [www.macromarkets.com](http://www.macromarkets.com).

<sup>10</sup>Real Estate Futures Gain Momentum in the U.S., Sausner, Rebecca, US Banker, June 2007.

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time as RPX introduction.<sup>11</sup> Since SPCS will most often be compared to RPX, we include a table of differences above in Exhibit 3.

Exhibit 4 lists all of the cities (MSAs) included in either index family. SPCS10 cities appear in all three indices. Note that Dallas and Portland (Oregon) are included only in SPCS20. New York and Chicago MSAs are slightly expanded beyond the official government definitions.

Exhibit 4

## Cities Covered by RPX and SPCS

MSA	RPX	SPCS20	SPCS10
Atlanta	✓	✓	
Boston	✓		✓
Charlotte	✓	✓	
Chicago	✓	✓	✓
Cleveland	✓	✓	
Columbus	✓		
Dallas		✓	
Denver	✓	✓	✓
Detroit	✓	✓	
Jacksonville	✓		
Las Vegas	✓	✓	✓
Los Angeles	✓	✓	✓
Miami	✓	✓	✓
Milwaukee	✓		
Minneapolis	✓	✓	
New York	✓	✓	✓
Philadelphia	✓		
Phoenix	✓	✓	
Portland		✓	
Sacramento	✓		
San Diego	✓	✓	✓
San Francisco	✓	✓	✓
San Jose	✓		
Seattle	✓	✓	
St. Louis	✓		
Tampa	✓	✓	
Washington	✓	✓	✓
Total	25	20	10

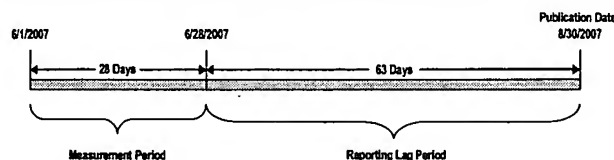
Source: Radar Logic, MacroMarkets, Morgan Stanley

## Lags, Lookbacks, and Measurement Periods

Both sets of indices utilize a lag (or lookback) between transaction and publishing dates because of the necessary reporting delays in the industry. Published daily, RPX uses a hard 63-day (7-week) lag and expressly has three index series having 1-, 7-, and 28-day measurement periods for data collection. For example, for the August 30 publication date, all RPX Indices had a transaction date of 6/28/07, and the 28-day lookback version uses data from June 1<sup>st</sup> through the transaction date.

Exhibit 5

## Timeline of RPX Collection to Publication



Source: Radar Logic, Morgan Stanley

By contrast, SPCS announces its new levels only on the last Tuesday of each month on a two-month lag (e.g., August 28th's announcement would be for the June index). SPCS has a 3-month measurement period, so the June index would also include sales that took place in May and April. The longer (and unchangeable) measurement period of SPCS tends to make those indices smoother and less volatile than RPX.

## Other Indices of Note

We previously mentioned HPI created by OFHEO, responsible for overseeing Fannie Mae and Freddie Mac. HPI tracks the performance of homes transactions involving conforming conventional mortgages purchased or securitized by the two agencies. The computation utilizes weighted repeated sales similar to SPCS methodology.<sup>12</sup> The maximum conforming loan limit is currently \$417,000 and has grown over the years, quadrupling since 1980. Even if we remove the non-purchase (i.e., refinanced homes) portion of that universe, the remainder focuses principally on the lower priced segment of the market, which is financed via a Government Sponsored Enterprise (GSE). We believe that this size bias keeps the HPI from gaining a foothold as a trading reference, although it should offer a useful pricing point of reference for agency MBS.

The National Association of Realtors builds a Median Sales Price Index on a Quarterly basis, but this does not control for home size substitution. Thus, a rising value may occur simply due to more supply and sales of larger properties. It is based on survey responses of its members capturing only 30-40% of all sales; it also builds in some seasonality adjustments. The drawback here is the relatively small coverage of actual trades.

## Summarizing the Index Types

We see three major types of house value indices: (1) return-compounded index levels, (2) median prices, and (3) price per square foot. Of these, we favor the newly introduced RPX (which measures ppsf) for several reasons. It includes the

<sup>11</sup> Some of these tenors are available only on semi-annual and yearly cycles.

<sup>12</sup> OFHEO Home Price Indexes: HPI Technical Description, Calhoun, Charles, March 1996.

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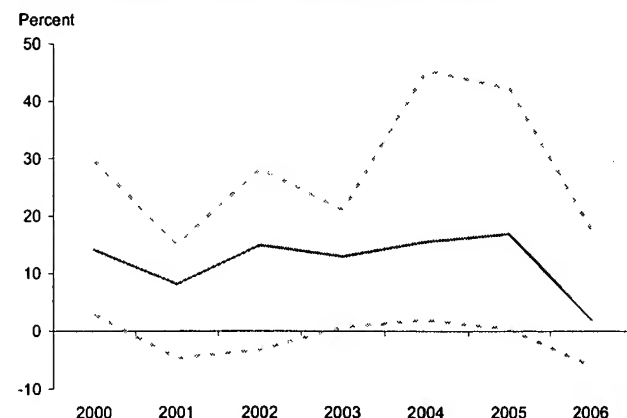
greatest number of real estate transactions, notably new home sales and condos (both of which SPCS lacks). It controls for home size better than median price indices, and it more easily compares homes of different sizes as well as different cities. The return-dependent indices (HPI and SPCS) do not easily measure different MSAs against each other (without some mental or numeric juggling). The RPX also includes foreclosures without filtering. Therefore, in our view, RPX emerges as the best tradable index among the different alternatives.

## RPX in the 21<sup>st</sup> Century

Looking at RPX annual histories from 2000 with proper publishing lags, we see that the overall market has done quite well, with an average yearly return of almost 13% (Exhibit 6). Again it is also clear that most years see a wide range of performance from best to worst MSA. We have seen Las Vegas' spectacular +40% rise in 2004 to several cities' mid-single-digit losses in 2006. San Jose's 5% loss in 2001 resulted from the dot.com fallout, although this figure was small in comparison to some of the losses on stocks.

Exhibit 6

### Best to Worst Yearly Returns within RPX



Source: Radar Logic, Morgan Stanley

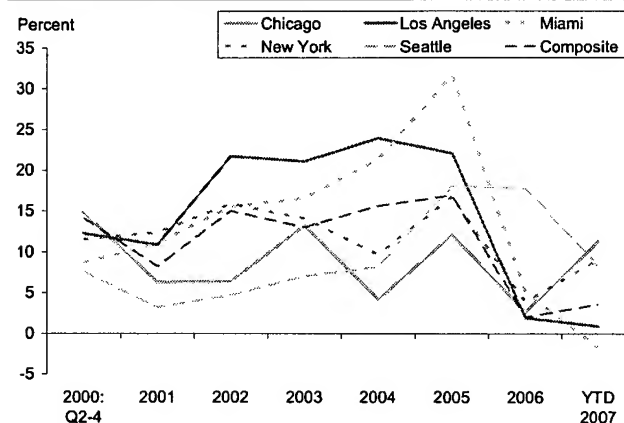
While longer term, we know the overall market disappointed beginning with the 1990 recession for several years, we also saw strong performances in some cities during that same period. Thus, we often see individual negative results with a story behind them. Looking further back in history, we remember the dropping oil prices in the mid-1980s driving down Texas and Oklahoma home values.

## Five City Tour

In the beginning of RPX launch, we expect that five MSAs will be more consistently quoted, traded, and marked. New York and Los Angeles represent the top two real estate markets in terms of size. Chicago is the largest non-coastal city in this set. Miami and Seattle allow for rounding out regional exposures in the Southeast and Northwest. This five-city group equals a little over half of the composite index. Its weighted average ppsf is about 10% higher than that of the composite. Exhibit 7 tracks yearly returns for 2000-06. This group performed slightly better than the composite index over that time. The chart includes 2007 through August to show the general slowing of the housing market.

Exhibit 7

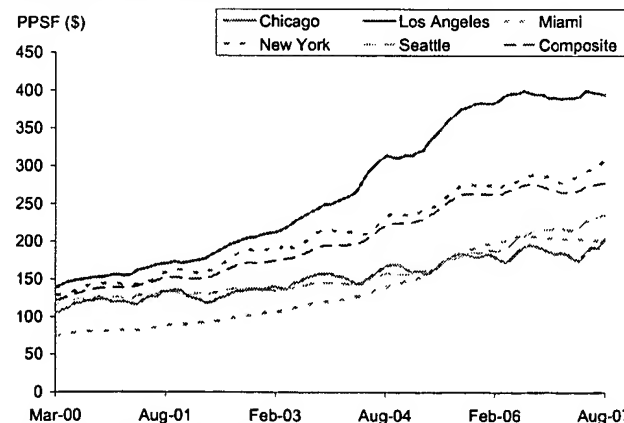
### Five MSAs: Total Return



Source: Radar Logic, Morgan Stanley

Exhibit 8

### Price per Square Foot: Five MSAs



Source: Radar Logic, Morgan Stanley



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The Exhibit 8 shows monthly ppsf values since early 2000. We see that Los Angeles has the highest value in this group at just under \$400/sf, and New York just beats the national composite level. Watching closely reveals explainable seasonality, especially in the colder (and windier) winter climates. For completeness, we include (in Exhibit 9) a table of current ppsf values for all MSAs covered by RPX.

Exhibit 9

## Current PPSF Values for all RPX MSAs

MSA	Bloomberg Ticker	PPSF	RPX Weight
Atlanta	RPX.AT28	104.03	2.4%
Boston	RPX.BO28	245.84	4.5%
Chicago	RPX.CG28	192.57	5.7%
Charlotte	RPX.CH28	100.46	0.6%
Cleveland	RPX.CL28	96.25	0.9%
Columbus	RPX.CO28	100.14	0.7%
Detroit	RPX.DT28	107.11	1.9%
Denver	RPX.DV28	151.14	1.5%
Jacksonville	RPX.JX28	126.48	0.7%
Los Angeles	RPX.LA28	395.18	16.1%
Las Vegas	RPX.LV28	172.47	1.4%
Miami	RPX.MI28	197.13	4.6%
Minneapolis	RPX.MN28	158.54	1.9%
Milwaukee	RPX.MW28	123.41	0.7%
New York	RPX.NY28	305.50	23.1%
Philadelphia	RPX.PH28	158.09	4.1%
Phoenix	RPX.PX28	158.54	2.7%
Sacramento	RPX.SC28	211.67	1.9%
Seattle	RPX.SE28	235.07	3.2%
San Francisco	RPX.SF28	454.96	7.0%
San Diego	RPX.SD28	312.69	3.7%
San Jose	RPX.SJ28	474.59	2.9%
St. Louis	RPX.SL28	95.62	1.2%
Tampa	RPX.TA28	137.43	1.6%
Washington	RPX.DC28	235.54	5.1%
Composite	RPX.CP28	275.95	100.0%

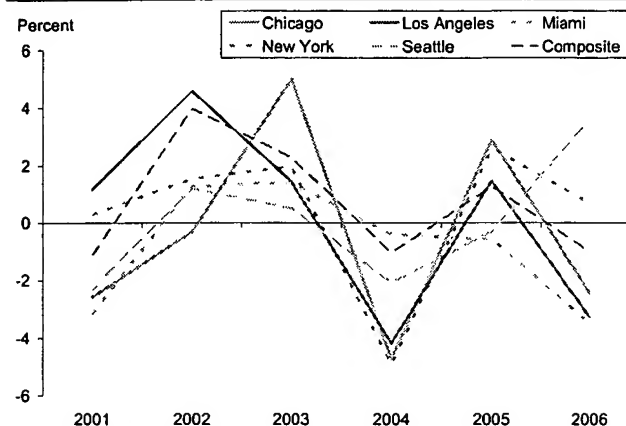
Source: Radar Logic, Morgan Stanley (as published on September 19, 2007)

## RPX vs. Case-Shiller Performance

Comparing the annual returns between RPX and SPCS for 2001-06, we find sufficient differences to thwart a 'doesn't matter' shrug (Exhibit 10). The differences in data collection period, new sales, condos, and square footage normalizing definitely make their presence felt, although we would be first to admit that quantifying the effects would take lots more work. It may not be easy to substitute one for the other without much thought.

Exhibit 10

## RPX Can Differ Greatly from SPCS



Source: Radar Logic, MacroMarkets, Morgan Stanley

## RPX vs. Other Financial Asset Classes

How can we possibly compare real estate with any other asset class? Housing had been on such a tear, especially earlier this decade. We decided to look at total returns of fixed income and equities to make the examination fairer (no hedging of interest rate exposure). In Exhibit 11, we list quarterly return statistics (2000 Q2 – 2007 Q2) for various asset classes. RPX greatly outperformed all other alternatives, but at greater volatility than many. RPX's Sharpe Ratio of 0.71 edges out IG credit by 30 bps and MBS by 25 bps. This is clearly a setup for future musings about optimal asset allocations, and we may see applications to add RPX exposure to multi-asset class portfolios, depending on one's view on real estate. To further establish the setup, we include the Risk/Return diagram in Exhibit 12. We caution to be cognizant of the time period that these data are based on – a period of robust growth in home prices. Further, the volatility of an instrument such as a total return swap based on RPX is likely to be higher than the volatility of the index itself.

Exhibit 11

## RPX Performs Against Other Assets (2000-2007)

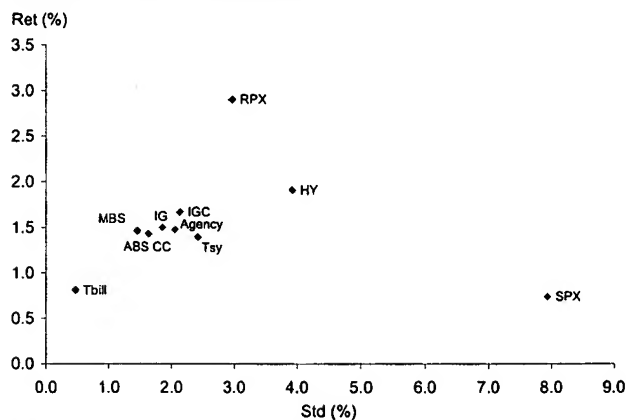
Asset Class	Avg Ret	Std Dev	Sharpe Ratio	RPX Corr
All Investment Grade	1.50%	1.85%	0.37	9.9%
Treasury	1.39%	2.42%	0.24	18.5%
Agency	1.47%	2.05%	0.33	12.8%
Investment Grade Credit	1.66%	2.13%	0.40	-0.3%
Credit Card ABS	1.43%	1.63%	0.38	9.6%
MBS	1.46%	1.45%	0.45	8.2%
T-bill	0.81%	0.47%	-	-15.8%
High Yield Credit	1.91%	3.92%	0.28	-40.7%
S&P 500	0.74%	7.94%	-0.01	-31.3%
RPX	2.90%	2.97%	0.71	100.0%

Source: Radar Logic, Yield Book Analytics, Morgan Stanley (all quarterly results)

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Exhibit 12

## RPX Territory in Risk/Return Space



Source: Radar Logic, Yield book Analytics, Morgan Stanley (Quarterly results 2000-2007)

## Housing versus Macro

Looking at the longer history of OFHEO's HPI, we see very low correlation with GDP changes. Housing returns were very low in the early 1990s beginning with that recession, but held in nicely during the 2001 recession, remaining in the 7% range for several years. Compared to CPI changes, HPI had a slightly higher correlation over both the longer and shorter term histories. By its low volatility construction, CPI of owner's equivalent rent does not have high correlation to housing prices (it in fact exhibits moderately negative correlation over time). At first blush, it is difficult to see any persistently strong relationships between macro time series and home prices. Perhaps the old rules have changed due to the huge run up in real estate, or we simply have not gone through enough full economic cycles.

## Initial RPX Trading Products

In the early stages of RPX introduction, we expect most trading to involve the 28-day aggregation of the composite and five individual MSAs mentioned above (perhaps on an inquiry basis). Settlement values will entail an average of the last 5 days of the month (to reduce the potential for single day volatility) on a calendar quarter cycle. Because of the reporting delay, this means that September 30 contracts use ppsf values near the end of July. The products traded should be both a forward contract and total return swap (TRS) with initial tenors of 1, 2, 3, 4, and 5 years. This compares favorably to what's available with SPCS.

Of the two trading contracts, we expect the TRS to be more popular. The quoting convention will be the fixed rate that is exchanged on a quarterly basis for the return of RPX. Taking

a long position in RPX is the same as being the receiver of that index's return. That party is also the payer of the fixed rate (stated on the offer side). Settlement is done T+3 after quarter's end using the aforementioned last 5-day average index level. The mechanics operate similar to other fixed-to-floating interest rate swap transactions: the buyer (long party) of the index pays one-quarter of the fixed annual rate on the underlying notional amount and receives the quarterly return of RPX on that same notional. The notional amount remains the same for the life of the contract, i.e., quarterly returns are additive. Quoting is also done on a non-compounded annual rate basis, thus 5% annual for 2 years creates a breakeven of 10%, not 10.25%.

Because of the downward expectations on housing returns near term, all quotes are typically negative, so shorting (for example) involves receiving the loss on real estate while paying a fixed rate. This just adds to the confusion of starting a new market, but we believe the advantages will ultimately justify the learning curve.<sup>13</sup>

## Who Should Use Property Derivatives?

While we easily picture investors of securitized products trading these new contracts, we can make a case for many other categories of users. Hedge funds, especially with macro-driven strategies, can put real estate views into play particularly with a relative-value perspective, both temporally and geographically. Owners of large residential developments can hedge their exposures and spread geographic risks. Credit and equity portfolio managers can take advantage of diversification. Banks and mortgage lenders can moderate housing impact on their loan portfolios. Mortgage loan originators and servicers are also other potential users. Municipalities can mitigate losses of housing permit and property tax revenues as assessments decline.

## Conclusion

With some large investors calling for a steep real estate downturn in 2008, and the continued threat of sub-prime troubles, it is difficult for many to have a view on housing that is not negative. Fortunately, there is now a way to express that view and the degree by which to hold it. There are also many ways to realize performance from relative views, geographically and otherwise. For a \$22 trillion asset class, this is can be huge.

<sup>13</sup> We will re-visit this topic with a detailed illustration in a future publication.

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**Credit Products Rating Distribution Table**
*(as of Sept 03, 2007)*

Rating	Coverage Universe		Investment Banking Clients (IBC)		
	Count	% of Total	Count	% of Total IBC	% of Rating Category
<b>Overweight</b>	72	37%	44	33%	61%
<b>Equal-weight</b>	77	40%	58	44%	75%
<b>Underweight</b>	44	23%	31	23%	70%
<b>Total</b>	193		133		

*Coverage includes all companies that we currently rate. Investment Banking Clients are companies from whom Morgan Stanley or an affiliate received investment banking compensation in the last 12 months.*

**Analyst Ratings Definitions**

**Overweight (O)** Over the next 6 months, the fixed income instrument's total return is expected to exceed the average total return of the relevant benchmark, as described in this report, on a risk adjusted basis.

**Equal-weight (E)** Over the next 6 months, the fixed income instrument's total return is expected to be in line with the average total return of the relevant benchmark, as described in this report, on a risk adjusted basis.

**Underweight (U)** Over the next 6 months, the fixed income instrument's total return is expected to be below the average total return of the relevant benchmark, as described in this report, on a risk adjusted basis.

**More volatile (V)** The analyst anticipates that this fixed income instrument is likely to experience significant price or spread volatility in the short term.

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# APPENDIX 3



**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re: Application of: Andrew T. HECHT Conf. No.: 6197  
Serial No.: 10/689,833  
Filed: October 20, 2003  
For: **METHOD FOR VALUING FORWARDS,  
FUTURES, AND OPTIONS ON REAL  
ESTATE**  
Examiner: Edward J. BAIRD  
Art Unit: 3609  
Customer No.: 23280  
Attorney Docket: 874.1001US

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Date 2/17/09

**DECLARATION OF ANDREW T. HECHT UNDER 37 C.F.R. § 1.132**

I, Andrew T. HECHT, being duly sworn, depose and say:

1. I am a Company founder and Member of the Board of Directors of RADAR LOGIC, INC., formerly named GLOBAL SKYLINE LLC, the Assignee of the above-identified application.
2. I am also the inventor and applicant of the above-identified patent application.
3. I have been a Senior Trading Executive with extensive experience as a trader and manager at one of the premier commodity trading organizations. Through my professional work experience I have managed all aspects of a variety of commodity businesses, as well as risk positions exceeding \$1.5B in gross value. I submit my curriculum vitae as Appendix A to this declaration in support of my credentials to speak on the subject matter as it relates to the present invention.
4. My educational background is as follows. I graduated from State University of New York at Albany receiving a Bachelors of Arts in Political Science/English.



5. I am completely familiar with the contents of the above-referenced patent application and I have been made aware of the issues raised by the Examiner in the Office Action dated October 20, 2008.

6. In support of the patentability of the invention, I state:

In 2003 I made application to the USPTO for a patent for my novel idea encompassing a method for valuing forwards, futures and options on real estate thereby establishing a way to mitigate the risk of the real estate market's appreciating or depreciating over time. The commercial enterprise created to embody my idea is Radar Logic Incorporated ([www.radarlogic.com](http://www.radarlogic.com)). We have had great success with respect to attracting market professionals to use the tools based on Radar Logic's daily indexes, thus far offered in residential real estate. Radar Logic's RPX is the fastest growing real estate derivative product and the product that the trading market in property derivatives has embraced. Morgan Stanley wrote a research piece favoring Radar Logic's RPX indexes. A copy of the review entitled "Morgan Stanley: Property Derivatives Insights: Pure Play on residential Realty" is attached to this Response as Appendix B. As noted in the attached review which compares RPX to other housing indices generated on a monthly basis, including the Case-Shiller Home Price Index, RPX:

[r]epresents daily transactions from 25 U.S. metropolitan statistical areas on a price per square foot measure. In our view, RPX emerges as the best tradable index among the different alternatives."

See attached as Appendix B: report entitled: "Morgan Stanley: Property Derivatives Insights: Pure Play on residential Realty", page 1, section "RPX Has Arrived".

The RPX indexes is the commercial embodiment of the method disclosed in the patent applications. Commercially, Radar Logic issues daily indexes on regions (MSAs- metropolitan statistical areas, other subset areas and zip codes) with enough data points or liquidity that finance and real estate professionals can use them to hedge the financial risks inherent in the real estate market and real estate related market products. From a practical perspective, the novelty and non-obvious nature of the method disclosed in the present application is that the methodology creates a **daily price** (spot price or cash market price) **per metric** (i.e., per square foot, per square meter, per acre and so on), which is used as a basis for risk positions in various sectors of the real estate market. The importance of the daily (spot) price is three fold:

1. **Benchmarking-** a daily price provides real estate market participants the ability to market-to-market risk positions and establish a forward curve. Using the daily price as a spot market and using the forward perception of prices traded by the real estate market as established by forward, future or option real estate derivative prices, the difference of the spot price and forward prices yields a "basis" (Spot price - Forward Price= Basis). This "basis" is central to establishing financial risk with respect to real estate. The transparency of a daily price is central to promoting market confidence and viability.
2. **Trading and Analytics-** the daily price for real estate is key in understanding the volatility of the underlying markets and the approach taken in the patent application was novel in that all other indexes established, while they might have data that is collected on a daily basis, they have always been issued and disseminated on a monthly or quarterly basis.
3. **Derivative instruments-** the daily price is the key cog in the success of derivative market instruments created as a result of the methods described in the patent

applications. Commercial success has stemmed from the daily or "spot market" price approach in each index created by Radar Logic which is the commercial vehicle created for the patent applications.

I pointed out during the personal interview conducted with the assigned Examiners of the present patent application, in my experience as a trader and someone who is used to taking and hedging market risks in a myriad of different markets, calculating the daily cash index price is significant because it allows for the opportunity for a transparent benchmark for the daily mark-to-market of risk positions and creation of a forward curve based on future perception of the market in relation to these daily prices. This concept was never before applied to the real estate markets and without a daily price a trader or one who has risk in real estate would be taking that risk in the blind and would only have monthly or quarterly prices to gauge their returns and risks.

I have reviewed the Florance patent reference currently being cited as prior art against the above-referenced patent application and it is my contention that while the Florance patent deals with the daily collection of data, Florance does not teach what is done with that data, e.g. how the data is manipulated to generate a daily cash index. Therefore Florance describes the collection of data but does not teach anything about the practical use of said data. Florance offers no specifics or detail on how to use the generated output and although Florance may suggest the creation of an index, Florance does not describe how to generate such an index as presently recited in the above-referenced patent application.

7. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 USC §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2/17/09  
Date

Andrew T. Hecht  
Andrew T. Hecht

# APPENDIX A

**Andrew T. Hecht**  
**500 West 43<sup>rd</sup> Street 3K**  
**New York, New York 10036**  
**212 967-5068 (home)**  
**917-856-2633 (cell)**

Andrew T. Hecht is a Senior Trading Executive with extensive experience as a trader and manager at one of the premier commodity trading organizations. Andrew T. Hecht managed all aspects of a variety of commodity businesses, as well as risk positions exceeding \$1.5B in gross value. He has demonstrated the ability to create markets, develop strong relationships, maintain ongoing business, develop new business, identify and create franchises and exploit franchise value.

## **PROFESSIONAL EXPERIENCE**

*RADAR LOGIC INC./GLOBAL SKYLINE LLC* June 2002-Present

Company founder, Member of the Board of Directors

- The company holds pending patents for the invention of a methodology for trading and valuing real estate futures, forwards and options.
- The company's products are currently trading in the over-the-counter market through seven licensed dealers and four licensed inter-dealer brokers.

*STANDARD PACIFIC CAPITAL* June 2006-December 2007

Co-Portfolio Manager of Commodity Hedge Fund

- Co-managed a portfolio of \$22 million in a variety of commodity markets
- Prepared marketing materials and gave presentations throughout the US

*GLOBAL ADVISORS LIMITED* 2000 - June 2002

Portfolio Manager-Metals

Responsible for managing an initial portfolio of \$30 million in metals futures/physicals and derivatives.

*REPUBLIC NATIONAL BANK / HSBC BANK USA* 1999 - 2000

Deputy Managing Director, Global Precious Metals Options

Responsible for worldwide market-making and risk in the global options book.

- Successfully closed down large risks in the bank's exotic options position. Traded profitably in 1999 and 2000.

*CANTOR FITZGERALD* 1997 - 1998

Managing Director, Commodities

Responsible for marketing and supervision of the commodities brokerage business.

- Set up and managed the precious metals, base metals and electricity brokering businesses.
- Arranged Associate-Broker Clearing member status on the London Metal Exchange.

*SALOMON, INC.* 1981 - 1997

General Manager, Sugar and Derivatives Marketing Department, Phibro, Inc. (1997)

Responsible for Sugar Department risk, both physical and futures, and for development and coordination of marketing efforts for derivatives on all commodity businesses.

- Introduced tripartite agreements covering both original and variation margin to eliminate credit risk from transactions with Russian producers and exporters of sour crude.
- Negotiated an equity interest in a sugar terminal at the port of Santos, Brazil representing a \$25 million gross investment.

Managing Director, Metals, Phibro Energy division of Salomon Inc. (1992 - 1997)

Director, Phibro Bullion Limited, London (1992 - 1997)

Responsible for the worldwide precious and nonferrous metals trading as well as foreign exchange and fixed income trading for the division. Member of the Phibro management committee.

- Actively traded and marketed swaps and other derivative instruments on a proprietary basis and with a variety of clients.
- Represented the parent company to fund managers and precious and nonferrous metals analysts, which directly resulted in an increase in the flow of equity, debt and commodity fund business.
- Introduced fund business and built a \$5MM annual franchise.

Vice President - Worldwide Department Head, Salomon Brothers Precious Metals Inc. (1991 - 1992)

Director, Salomon Bullion Limited, London (1991 - 1992)

Responsible for successfully moving a profitable business from Philipp Brothers Inc. to Salomon Brothers Inc.

- Developed, negotiated, structured and managed the Salmaz joint venture with Almazjuvirexport of the former USSR which contributed \$4MM in net profits over a two year period.
- Designed and traded commodity-equity arbitrages in gold, aluminum, nickel and copper resulting in \$3MM in profits.
- Advised precious metals and nonferrous metal producers as well as institutional investors, supranational organizations and high net worth individuals on commodity related debt and equity investments.
- Advised the United Nations on logistics in arranging for return of gold taken from Kuwait by Iraq during the occupation.

Managing Director, Worldwide Department Head, Precious Metals and Nickel, Philipp Brothers Inc. (1990 - 1991)

Director, Philipp Brothers Bullion Limited, London (1990 - 1991)

Triaged all aspects of precious metals and nickel business as well as commodity options with a staff of up to 62. Member of the Philipp Brothers Inc. management committee.

- Increased Central Bank deposits from 500K ounces to 1.5MM ounces.
- Introduced gold asset mobilization to a variety of Central Banks who deposited metal for the first time with Phillip Brothers Inc.
- Developed financial products for LDC Central Banks utilizing their limited gold reserves.

Director, London Department Head, Precious Metals, Philipp Brothers Bullion Limited, London (1988 - 1990)

Managed all aspects of dealing, marketing, operations, risk management and regulatory relationships for the London company.

- Revitalized a loss-making business that resulted in \$20MM in net profits over a two year period.
- Directed the issue of three separate warrants. Each issue was \$50MM - \$100MM in size with profitability ranging between \$250K and \$1.5MM per issue.

Marketing Manager - Worldwide Precious Metals, Philipp Brothers Inc. (1987 - 1988)

Responsible for developing and executing a marketing strategy for the department, worldwide, covering Central Banks, producers, consumers and speculators.

- Actively negotiated and closed medium and long term hedging packages with gold and silver producers in the U.S., Canada, South America, Australia and Europe. Increased producer business 300%.
- Responsible for dramatically increasing the amount of flow business attained by the firm's dealing desks in New York, London and Hong Kong.

Trader, Philipp Brothers Inc. (1983 - 1987)

Spot and Forward Precious Metal trading. Commodity Options trading.

- Marketed and traded a variety of commodity derivatives.
- Responsible for a variety of profitable option books which from time to time included: gold, silver, platinum, copper, aluminum, nickel, tin, sugar, soybeans, corn, wheat and crude oil.

Assistant Manager - Traffic Department, Philipp Brothers Inc. (1981 - 1983)

Managed traffic of tin metal, antimony ores and concentrates as well as precious metals.

- Initiated examination of various consignment businesses in precious metals, which highlighted lack of profitability. These businesses were subsequently discontinued.

## EDUCATION

B.A., Political Science/English, State University of New York at Albany

## ASSOCIATIONS

NYSAR (2003-2006) New York State Association of Realtors. Member number 641516551

LBMA (1989 - 1991) Worked on various committees and co-developed standard terms and conditions for the London Bullion Market

COMEX (1988 - 1996) Held three seats on the exchange Active on several committees

NFA (1986 - Present) Associated person

## PUBLICATIONS

Published freelance writer in Barrons.

Published and interviewed in periodicals, including the Financial Times of London and Barrons.

# APPENDIX B

September 21, 2007

Structured Credit

## Property Derivatives Insights

### Pure Play on Residential Realty

**Historically, Limited Avenues for Expressing Direct Views on Housing:** While there are a host of alternatives, they represent indirect measures of housing market trends and are for the most part, long only – not direct investments in housing, and largely devoid of geographic specificity. The advent of residential property derivatives trading as a pure play on housing is a big step towards alleviating this constraint.

**RPX Has Arrived:** Radar Logic Incorporated has launched the Residential Property Index from which futures, total return swaps, and other products can trade. It represents daily transactions from 25 U.S. metropolitan statistical areas on a price per square foot measure. In our view, RPX emerges as the best tradable index among the different alternatives. We describe RPX index mechanics and compare it with other indices of home prices. We also briefly describe the workings of the RPX total return swap.

**Housing Is Not Always a One-Way Trade:** Although at the national level, home prices have generally grown each year, there were pockets of the market that lost money from time to time. Dispersion of annual returns is wide, even in good years. Therefore, there could be many relative-value plays among different geographical areas.

**Who Could Play in Housing:** We think RPX based property derivatives offer long and short opportunities for a wide range of investors – hedge funds, asset managers, mortgage loan originators/servicers and home builders/developers. They offer diversification benefits to enhance returns as well as help manage risks. Ultimately, RPX provides an efficient way to express strong views on residential housing.

#### MORGAN STANLEY FIXED INCOME RESEARCH

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The Primary Analyst(s) identified above certify that the views expressed in this report accurately reflect his/her/their personal views about the subject securities/instruments/issuers, and no part of his/her/their compensation was, is or will be directly or indirectly related to the specific views or recommendations contained herein.

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Property Derivatives Insights

## Property Derivatives Insights

### Pure Play on Residential Realty

Primary Analysts:  
Young-Sup Lee (212) 761-1480  
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Everyone loves to talk about residential real estate, but expressing investment views directly on real estate from a long/short relative value perspective has always been challenging. At an individual level, the conventional wisdom was and still is simply to buy a house. Then trade up to a bigger house, and maybe make that house bigger still. Institutional investors' avenues for residential real estate exposure are much varied – ranging from investing in real estate funds, mortgages-backed securities, and stocks of homebuilders and mortgage lenders. A few aspects of these different ways to invest in real estate are worth noting. They are for the most part, long only; not all are direct investments in housing,<sup>1</sup> and they are largely devoid of geographic specificity. Thus, it is difficult to express investible views that exploit regional differences in housing markets.

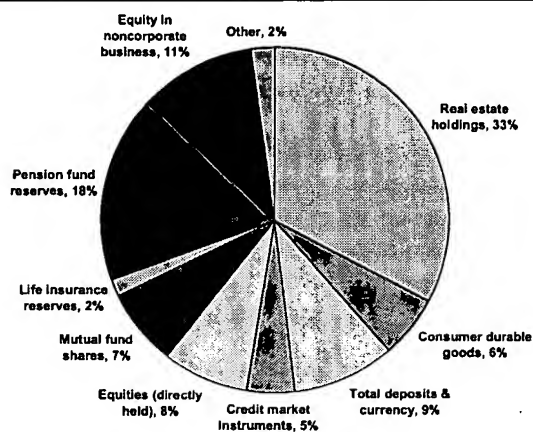
Property derivatives trading seeks to address these gaping holes in the investment opportunity set for institutional investors. In this report, our first under this new flagship publication, we briefly introduce the backdrop of real estate in the U.S., explain the development of alternative housing indices, and focus on one, the Residential Price Index (RPX), which we expect to be the index on which many property derivatives will trade in the OTC market. With the rollout of RPX-based trading launched this week, we think it is important for all interested investors to understand the mechanics of residential home price indices and the specifics of historical housing performance to be able to effectively use these new products (and other upcoming ones).

#### Housing Matters

Since 1965, homeownership percentages have climbed from 63% to 68%,<sup>2</sup> despite a dip in the 1985-1995 period. Thus, the nation's psychology, status, and infrastructure (not to mention tax policy) has increasingly favored homeownership over time. Consequently, real estate constitutes the single largest asset in the portfolios of the US household (Exhibit 1).

<sup>1</sup>Other factors besides the value of homes can influence their performance.  
<sup>2</sup>U.S. Census.

Exhibit 1  
**Largest Slice Deserves Much Attention**



Source: Federal Reserve

The increase in mortgage applications and decline in interest rates combine to showcase the attractiveness of real estate buying and investing in the long run. Despite the tremendous growth in house prices, affordability has been maintained and only recently has shown signs of dipping.<sup>3</sup> Median incomes have more than kept up pace to support monthly mortgage payments on the median house. Given this landscape, the importance of tradable residential real estate instruments is even more salient.

On the other hand, sub-prime related shocks continue to reverberate across the global financial system, far beyond the mortgage-backed securities and related structured products. While we think that the poor performance of recent sub-prime collateral pools is largely a result of lenient lending standards, the recent slowdown in home prices has not helped. As such, there has been an investor need to short housing.

Up until now, there was no direct tradable instrument to express views on residential real estate other than buying up large tracts of real estate (with no way to go net short). Obviously, such an investment that would require a large commitment in maintenance, taxes, and complicated unwinds. However, the current opportunity set offers, at best, indirect bets on housing.

<sup>3</sup>Housing Affordability Composite Index, National Association of Realtors.

September 21, 2007  
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## The Alphabet Soup of Indirect Housing Bets: ABS, ABS CDO, ABX and TABX

As noted earlier, a popular financial avenue to go long housing risk has been either through stocks related to the residential real estate sector (e.g., REITs) or by buying securities that are backed by residential mortgages of various types. ABS CDOs were another means of going long leveraged exposure to real estate. The latter took off in a big way since early 2003; we estimate the outstanding ABS CDO market to be in the \$550-600 billion range.

The advent of CDS on ABS through standardized documentation in July 2005 marked a significant new development: it opened up an attractive method for investors to go both long and short ABS risk. CDS on CDOs was a subsequent development essentially along similar lines. Macro hedge funds and others have used ABS CDS and CDS on CDOs as well as standardized indices like ABX and TABX to express strong negative views on sub-prime housing credit, with varying degrees of success.

We reiterate the indirect nature of the housing bet embedded in these instruments, whether going long or short. While home prices are undoubtedly integral to the performance of ABS and ABS CDO securities, several other pertinent factors come into play. Structural features unique to ABS and ABS CDOs (e.g., triggers, turbos, step-down, cash flow waterfall, over-collateralization spread, etc.) have substantial influence on their performance. The mortgage pools underlying ABS are, by definition, large geographically well-dispersed pools. Even though certain states like California and Florida dominate in many ABS pools, their weights are still too low to achieve desired geographic specificity. Further, ABS CDOs are typically managed pools with a CDO manager. Thus, security selection and trade timing have a significant impact on CDO performance. Finally, ABS CDOs involve sub-prime ABS and reflect only that residential segment. This is true also of ABX, TABX, and more generally ABS CDS – all pertaining to the sub-prime sector only, not the general housing sector.

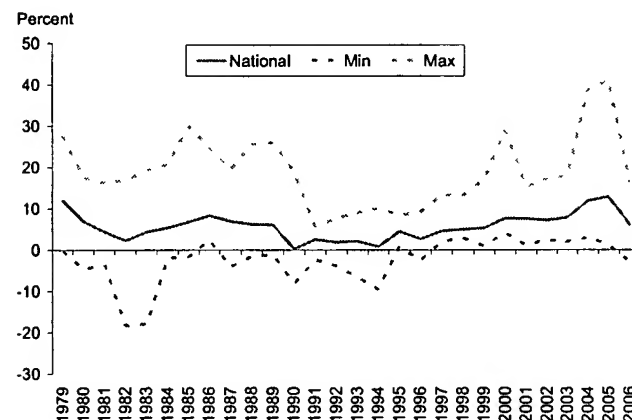
This alphabet soup was an imperfect and leveraged way to spell out “real estate.” An instrument whose performance mirrors only residential real estate prices would be better. However, given that homes are disparate assets (even in cookie-cutter neighborhoods), we need standardized indices whose performance is tied solely to home prices and are geographically controlled.

One simple way to see geographic variation is to look at the histories of the OFHEO (Office of Federal Housing Enterprise Oversight) HPI (Home Price Index) for multiple cities in the

U.S. (more about this particular index and city selection in a later section). The dotted lines in Exhibit 2 display the maximum and minimum metropolitan area returns experienced each year. Thus, the regional differences are quite significant, even in very strong periods.

Exhibit 2

### Housing Returns: A Range of Differences



Source: Office of Federal Housing Enterprise Oversight

### The Indexation Problem

First, we take a step back. There are three well-known requirements of a good value index: (1) consistent pricing, (2) comprehensive coverage and (3) being rules-based. To that end, we can safely say that any real estate index cannot fully satisfy all three requirements. Since not all houses trade regularly, we can never really have consistent pricing over time. For the small subset that does trade, there are lengthy settlement times (from agreement to closing), reporting delays (from closing date to public disclosure), and likely human recording errors. Due to small sample size, we cannot have deep coverage.<sup>4</sup> Therefore, no matter what set of rules an index uses, every index will have some limitations.

What we end up with in all cases is usually a home sales price index on a representative segment. The index, however, cannot measure missed sales, contemplated transactions, or delaying tactics. We do however believe that the law of large numbers<sup>5</sup> does not need much policing. If smaller homes are more in vogue, that *should* be reflected in the price action. The same holds true for foreclosures, renovations, job displacements and socio-economic shifts. If an impact is truly

<sup>4</sup>By comparison, the investment grade credit indices generally include half of all bonds outstanding.

<sup>5</sup>The law of large numbers states that the population average converges to its true mean as sample size increases.

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isolated, its inclusion should not matter. If an effect is more common, the published index should reflect that trend. Luckily, this also makes index construction and maintenance much easier.

## Enter the RPX

RPX was created by Radar Logic Incorporated. Begun in 2003 as Global Skyline, the company evolved into its current form via joint partnerships with Ventana Systems and Miller Samuel. RPX measures housing value in terms of *price per square foot*, or ppsf.<sup>6</sup> Perhaps the typical homeowner never thinks in terms of ppsf, but there are situations where it becomes quite common and eminently helpful. For example, New York City has many small apartments where slight differences in size can cause huge swings in selling price. Architects and builders also often use ppsf to quote construction costs. Ultimately it is an excellent way to consolidate and compare vastly different sized property on a more even (*square*) footing. Mansions can coexist with studio apartments on a more common playing field, though on potentially different parts of that distribution. Using this 'normalized' index adjusts for homes that have been enlarged in the recent renovation boom, though it may not reflect an upgrading to a gourmet kitchen.

Land acreage can only indirectly affect this pricing measure: two identical houses on different sized lots would have vastly different ppsf values. The extra land would only serve as a "feature" to potentially enhance the walls and floors; it would not explicitly enter calculations. Different municipalities may also have varying rules regarding square footage measurement. There are no adjustments made to each district's official size numbers.

RPX includes covers 25 Metropolitan Statistical Areas (MSAs) – major urban centers used for housing price determinations<sup>7</sup> and a nationwide composite. This composite uses fixed published weights of the underlying MSAs, with periodic rebalancing (2-3 years) using official census and proprietary data. The index incorporates all residential real estate transactions that take place on that day. This includes existing *and new* condominiums, stand-alone houses, and multi-family homes. Each sale is converted into a ppsf using publicly available data. All closed (i.e., completed) transactions are then fitted to a multi-parameter distribution

with the resulting median becoming that day's index level.<sup>8</sup> Foreclosures and short-term "flips" are included, but certain non-arm's-length exchanges are eliminated. Every transaction is equally weighted. If a particular region experienced significant anomalous sales, that would be captured in that market's index value.

## Case-Shiller Indices

Of all other residential housing indices, the most well known are the S&P/Case-Shiller (SPCS). These were originally developed to cover 20 MSAs and two composites.<sup>9</sup> SPCS relies on repeat-sales observations on single-family houses; it does not include new home or condominium sales. It also screens out non-arm's-length and severe outlier transactions – thus it potentially filters out properties with major remodels at the upper end and foreclosures at the lower end. Case-Shiller market-weights each sale and also weights transactions (inversely) by the length of time between transfers. Short-term 'flips' are disallowed.

Exhibit 3

### How RPX Compares to SPCS

Index	RPX	SPCS
Provider	Radar Logic	MacroMarkets
# MSAs	25	10 or 20
History Inception	2000	1987
Exchange	None	CME
Traded Beginning	Sept 2007	May 2006
Longest Contract	5 Year (Qtrly Cycle)	5 Year (Annual Cycle)
Frequency	Daily	Monthly
Lag or Lookback	63 Days	2 Months
Data Collection Period	1-, 7-, or 28-Days	3 Months
Underlying Concept	Distribution Fitting	Repeat Sales
New Sales	Included	Not Included
Condominiums	Included	Not Included
Foreclosures	Included	Potentially Filtered
Non-Arm's-Length Trade	Not Included	Not Included
Home Holding Period	No Minimum	6 Months Minimum
Transactions Weighted	Equally Weighted	Less for Longer Holding
Additional Filters	Suspected Data Error Missing Data	Suspected Data Error Changed Property Type Substantial Physical Change

Source: Radar Logic, MacroMarkets, Morgan Stanley

This index is traded in derivative form on the Chicago Mercantile Exchange (CME) and has seen about \$350MM in traded notional from its May 2006 inception through June 2007.<sup>10</sup> While contracts were limited to one-year expirations, it should see expansions to five-year contracts around the same

<sup>6</sup>The Radar Logic Index Methodology, Radar Logic, 2007. Data available at [www.radarlogic.com](http://www.radarlogic.com).

<sup>7</sup>The Office of Management and Budget, or OMB established MSA definitions.

<sup>8</sup>The shape is determined using 365 days of data, but the median just uses 1 day's data at that assumed shape. Please see The Radar Logic Daily Index (White Paper), Ventana Systems, Inc., Kagalis, Marios et al. March 28, 2007.

<sup>9</sup>S&P/Case-Shiller Home Price Indices, Standard & Poor's, February 7, 2007. Data is available at [www.macromarkets.com](http://www.macromarkets.com).

<sup>10</sup>"Real Estate Futures Gain Momentum in the U.S.," Sausner, Rebecca, US Banker, June 2007.

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time as RPX introduction.<sup>11</sup> Since SPCS will most often be compared to RPX, we include a table of differences above in Exhibit 3.

Exhibit 4 lists all of the cities (MSAs) included in either index family. SPCS10 cities appear in all three indices. Note that Dallas and Portland (Oregon) are included only in SPCS20. New York and Chicago MSAs are slightly expanded beyond the official government definitions.

Exhibit 4

## Cities Covered by RPX and SPCS

MSA	RPX	SPCS20	SPCS10
Atlanta	✓	✓	
Boston	✓	✓	✓
Charlotte	✓	✓	
Chicago	✓	✓	✓
Cleveland	✓	✓	
Columbus	✓		
Dallas		✓	
Denver	✓	✓	✓
Detroit	✓	✓	
Jacksonville	✓		
Las Vegas	✓	✓	✓
Los Angeles	✓	✓	✓
Miami	✓	✓	✓
Milwaukee	✓		
Minneapolis	✓	✓	
New York	✓	✓	✓
Philadelphia	✓		
Phoenix	✓	✓	
Portland		✓	
Sacramento	✓		
San Diego	✓	✓	✓
San Francisco	✓	✓	✓
San Jose	✓		
Seattle	✓	✓	
St. Louis	✓		
Tampa	✓	✓	
Washington	✓	✓	✓
Total	25	20	10

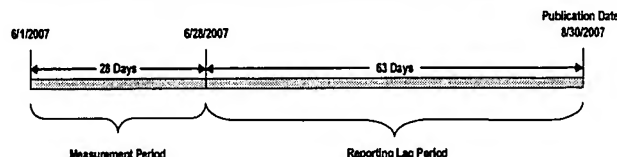
Source: Radar Logic, MacroMarkets, Morgan Stanley

## Lags, Lookbacks, and Measurement Periods

Both sets of indices utilize a lag (or lookback) between transaction and publishing dates because of the necessary reporting delays in the industry. Published daily, RPX uses a hard 63-day (7-week) lag and expressly has three index series having 1-, 7-, and 28-day measurement periods for data collection. For example, for the August 30 publication date, all RPX Indices had a transaction date of 6/28/07, and the 28-day lookback version uses data from June 1<sup>st</sup> through the transaction date.

Exhibit 5

## Timeline of RPX Collection to Publication



Source: Radar Logic, Morgan Stanley

By contrast, SPCS announces its new levels only on the last Tuesday of each month on a two-month lag (e.g., August 28th's announcement would be for the June index). SPCS has a 3-month measurement period, so the June index would also include sales that took place in May and April. The longer (and unchangeable) measurement period of SPCS tends to make those indices smoother and less volatile than RPX.

## Other Indices of Note

We previously mentioned HPI created by OFHEO, responsible for overseeing Fannie Mae and Freddie Mac. HPI tracks the performance of homes transactions involving conforming conventional mortgages purchased or securitized by the two agencies. The computation utilizes weighted repeated sales similar to SPCS methodology.<sup>12</sup> The maximum conforming loan limit is currently \$417,000 and has grown over the years, quadrupling since 1980. Even if we remove the non-purchase (i.e., refinanced homes) portion of that universe, the remainder focuses principally on the lower priced segment of the market, which is financed via a Government Sponsored Enterprise (GSE). We believe that this size bias keeps the HPI from gaining a foothold as a trading reference, although it should offer a useful pricing point of reference for agency MBS.

The National Association of Realtors builds a Median Sales Price Index on a Quarterly basis, but this does not control for home size substitution. Thus, a rising value may occur simply due to more supply and sales of larger properties. It is based on survey responses of its members capturing only 30-40% of all sales; it also builds in some seasonality adjustments. The drawback here is the relatively small coverage of actual trades.

## Summarizing the Index Types

We see three major types of house value indices: (1) return-compounded index levels, (2) median prices, and (3) price per square foot. Of these, we favor the newly introduced RPX (which measures ppsf) for several reasons. It includes the

<sup>11</sup>Some of these tenors are available only on semi-annual and yearly cycles.

<sup>12</sup>OFHEO Home Price Indexes: HPI Technical Description, Calhoun, Charles, March 1996.

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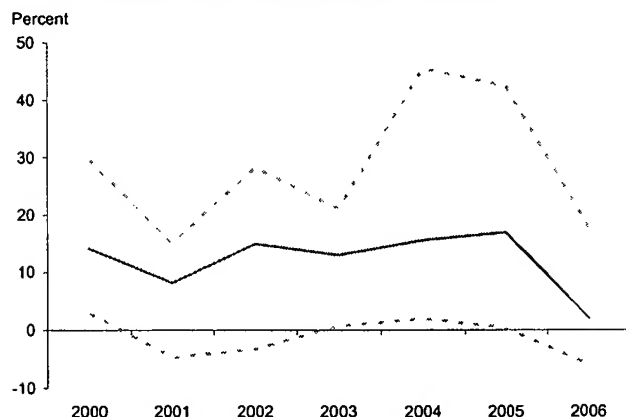
greatest number of real estate transactions, notably new home sales and condos (both of which SPCS lacks). It controls for home size better than median price indices, and it more easily compares homes of different sizes as well as different cities. The return-dependent indices (HPI and SPCS) do not easily measure different MSAs against each other (without some mental or numeric juggling). The RPX also includes foreclosures without filtering. Therefore, in our view, RPX emerges as the best tradable index among the different alternatives.

## RPX in the 21<sup>st</sup> Century

Looking at RPX annual histories from 2000 with proper publishing lags, we see that the overall market has done quite well, with an average yearly return of almost 13% (Exhibit 6). Again it is also clear that most years see a wide range of performance from best to worst MSA. We have seen Las Vegas' spectacular +40% rise in 2004 to several cities' mid-single-digit losses in 2006. San Jose's 5% loss in 2001 resulted from the dot.com fallout, although this figure was small in comparison to some of the losses on stocks.

Exhibit 6

### Best to Worst Yearly Returns within RPX



While longer term, we know the overall market disappointed beginning with the 1990 recession for several years, we also saw strong performances in some cities during that same period. Thus, we often see individual negative results with a story behind them. Looking further back in history, we remember the dropping oil prices in the mid-1980s driving down Texas and Oklahoma home values.

## Five City Tour

In the beginning of RPX launch, we expect that five MSAs will be more consistently quoted, traded, and marked. New York and Los Angeles represent the top two real estate markets in terms of size. Chicago is the largest non-coastal city in this set. Miami and Seattle allow for rounding out regional exposures in the Southeast and Northwest. This five-city group equals a little over half of the composite index. Its weighted average ppsf is about 10% higher than that of the composite. Exhibit 7 tracks yearly returns for 2000-06. This group performed slightly better than the composite index over that time. The chart includes 2007 through August to show the general slowing of the housing market.

Exhibit 7

### Five MSAs: Total Return

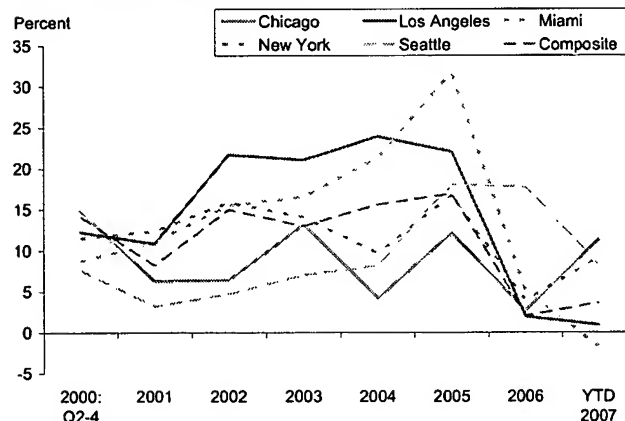
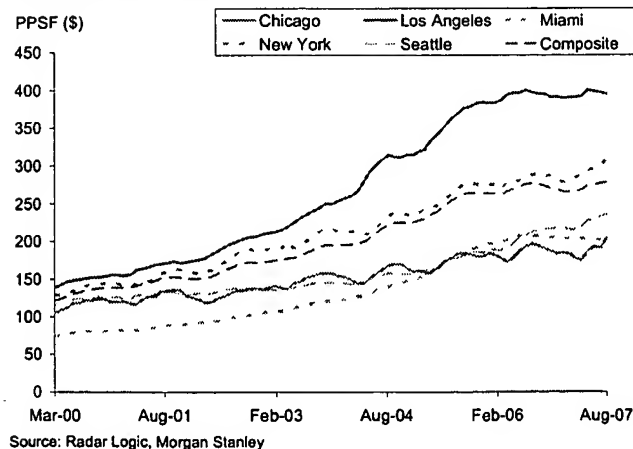


Exhibit 8

### Price per Square Foot: Five MSAs



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The Exhibit 8 shows monthly ppsf values since early 2000. We see that Los Angeles has the highest value in this group at just under \$400/sf, and New York just beats the national composite level. Watching closely reveals explainable seasonality, especially in the colder (and windier) winter climates. For completeness, we include (in Exhibit 9) a table of current ppsf values for all MSAs covered by RPX.

Exhibit 9

## Current PPSF Values for all RPX MSAs

MSA	Bloomberg Ticker	PPSF	RPX Weight
Atlanta	RPX.AT28	104.03	2.4%
Boston	RPX.BO28	245.84	4.5%
Chicago	RPX.CG28	192.57	5.7%
Charlotte	RPX.CH28	100.46	0.6%
Cleveland	RPX.CL28	96.25	0.9%
Columbus	RPX.CO28	100.14	0.7%
Detroit	RPX.DT28	107.11	1.9%
Denver	RPX.DV28	151.14	1.5%
Jacksonville	RPX.JX28	126.48	0.7%
Los Angeles	RPX.LA28	395.18	16.1%
Las Vegas	RPX.LV28	172.47	1.4%
Miami	RPX.MI28	197.13	4.6%
Minneapolis	RPX.MN28	158.54	1.9%
Milwaukee	RPX.MW28	123.41	0.7%
New York	RPX.NY28	305.50	23.1%
Philadelphia	RPX.PH28	158.09	4.1%
Phoenix	RPX.PX28	158.54	2.7%
Sacramento	RPX.SC28	211.67	1.9%
Seattle	RPX.SE28	235.07	3.2%
San Francisco	RPX.SF28	454.96	7.0%
San Diego	RPX.SD28	312.69	3.7%
San Jose	RPX.SJ28	474.59	2.9%
St. Louis	RPX.SL28	95.62	1.2%
Tampa	RPX.TA28	137.43	1.6%
Washington	RPX.DC28	235.54	5.1%
Composite	RPX.CP28	275.95	100.0%

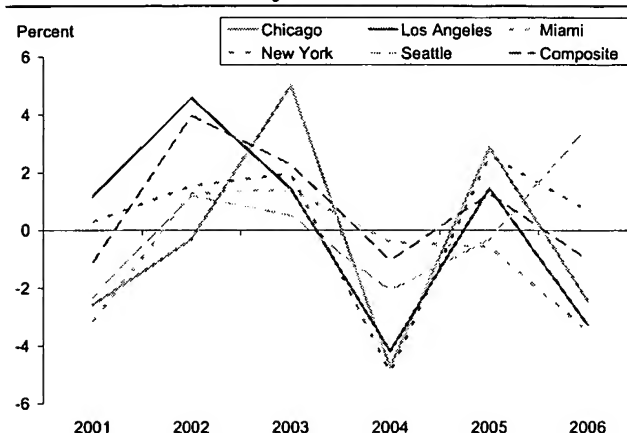
Source: Radar Logic, Morgan Stanley (as published on September 19, 2007)

## RPX vs. Case-Shiller Performance

Comparing the annual returns between RPX and SPCS for 2001-06, we find sufficient differences to thwart a 'doesn't matter' shrug (Exhibit 10). The differences in data collection period, new sales, condos, and square footage normalizing definitely make their presence felt, although we would be first to admit that quantifying the effects would take lots more work. It may not be easy to substitute one for the other without much thought.

Exhibit 10

## RPX Can Differ Greatly from SPCS



Source: Radar Logic, MacroMarkets, Morgan Stanley

## RPX vs. Other Financial Asset Classes

How can we possibly compare real estate with any other asset class? Housing had been on such a tear, especially earlier this decade. We decided to look at total returns of fixed income and equities to make the examination fairer (no hedging of interest rate exposure). In Exhibit 11, we list quarterly return statistics (2000 Q2 – 2007 Q2) for various asset classes. RPX greatly outperformed all other alternatives, but at greater volatility than many. RPX's Sharpe Ratio of 0.71 edges out IG credit by 30 bps and MBS by 25 bps. This is clearly a setup for future musings about optimal asset allocations, and we may see applications to add RPX exposure to multi-asset class portfolios, depending on one's view on real estate. To further establish the setup, we include the Risk/Return diagram in Exhibit 12. We caution to be cognizant of the time period that these data are based on – a period of robust growth in home prices. Further, the volatility of an instrument such as a total return swap based on RPX is likely to be higher than the volatility of the index itself.

Exhibit 11

## RPX Performs Against Other Assets (2000-2007)

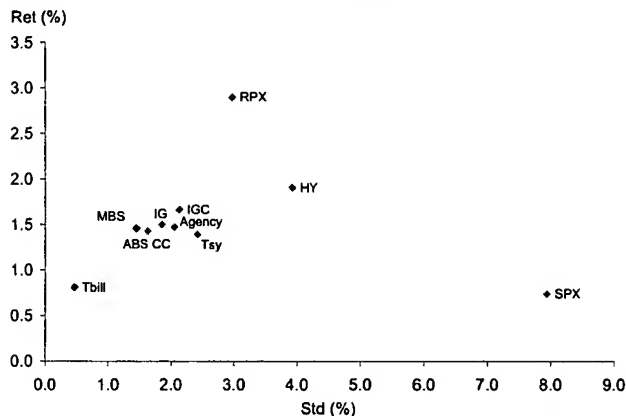
Asset Class	Avg Ret	Std Dev	Sharpe Ratio	RPX Corr
All Investment Grade	1.50%	1.85%	0.37	9.9%
Treasury	1.39%	2.42%	0.24	18.5%
Agency	1.47%	2.05%	0.33	12.8%
Investment Grade Credit	1.66%	2.13%	0.40	-0.3%
Credit Card ABS	1.43%	1.63%	0.38	9.6%
MBS	1.46%	1.45%	0.45	8.2%
T-bill	0.81%	0.47%	-	-15.8%
High Yield Credit	1.91%	3.92%	0.28	-40.7%
S&P 500	0.74%	7.94%	-0.01	-31.3%
RPX	2.90%	2.97%	0.71	100.0%

Source: Radar Logic, Yield Book Analytics, Morgan Stanley (all quarterly results)

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Exhibit 12

## RPX Territory in Risk/Return Space



Source: Radar Logic, Yield book Analytics, Morgan Stanley (Quarterly results 2000-2007)

## Housing versus Macro

Looking at the longer history of OFHEO's HPI, we see very low correlation with GDP changes. Housing returns were very low in the early 1990s beginning with that recession, but held in nicely during the 2001 recession, remaining in the 7% range for several years. Compared to CPI changes, HPI had a slightly higher correlation over both the longer and shorter term histories. By its low volatility construction, CPI of owner's equivalent rent does not have high correlation to housing prices (it in fact exhibits moderately negative correlation over time). At first blush, it is difficult to see any persistently strong relationships between macro time series and home prices. Perhaps the old rules have changed due to the huge run up in real estate, or we simply have not gone through enough full economic cycles.

## Initial RPX Trading Products

In the early stages of RPX introduction, we expect most trading to involve the 28-day aggregation of the composite and five individual MSAs mentioned above (perhaps on an inquiry basis). Settlement values will entail an average of the last 5 days of the month (to reduce the potential for single day volatility) on a calendar quarter cycle. Because of the reporting delay, this means that September 30 contracts use ppsf values near the end of July. The products traded should be both a forward contract and total return swap (TRS) with initial tenors of 1, 2, 3, 4, and 5 years. This compares favorably to what's available with SPCS.

Of the two trading contracts, we expect the TRS to be more popular. The quoting convention will be the fixed rate that is exchanged on a quarterly basis for the return of RPX. Taking

a long position in RPX is the same as being the receiver of that index's return. That party is also the payer of the fixed rate (stated on the offer side). Settlement is done T+3 after quarter's end using the aforementioned last 5-day average index level. The mechanics operate similar to other fixed-to-floating interest rate swap transactions: the buyer (long party) of the index pays one-quarter of the fixed annual rate on the underlying notional amount and receives the quarterly return of RPX on that same notional. The notional amount remains the same for the life of the contract, i.e., quarterly returns are additive. Quoting is also done on a non-compounded annual rate basis, thus 5% annual for 2 years creates a breakeven of 10%, not 10.25%.

Because of the downward expectations on housing returns near term, all quotes are typically negative, so shorting (for example) involves receiving the loss on real estate while paying a fixed rate. This just adds to the confusion of starting a new market, but we believe the advantages will ultimately justify the learning curve.<sup>13</sup>

## Who Should Use Property Derivatives?

While we easily picture investors of securitized products trading these new contracts, we can make a case for many other categories of users. Hedge funds, especially with macro-driven strategies, can put real estate views into play particularly with a relative-value perspective, both temporally and geographically. Owners of large residential developments can hedge their exposures and spread geographic risks. Credit and equity portfolio managers can take advantage of diversification. Banks and mortgage lenders can moderate housing impact on their loan portfolios. Mortgage loan originators and servicers are also other potential users. Municipalities can mitigate losses of housing permit and property tax revenues as assessments decline.

## Conclusion

With some large investors calling for a steep real estate downturn in 2008, and the continued threat of sub-prime troubles, it is difficult for many to have a view on housing that is not negative. Fortunately, there is now a way to express that view and the degree by which to hold it. There are also many ways to realize performance from relative views, geographically and otherwise. For a \$22 trillion asset class, this is can be huge.

<sup>13</sup> We will re-visit this topic with a detailed illustration in a future publication.

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(as of Sept 03, 2007)

Rating	Coverage Universe		Investment Banking Clients (IBC)		
	Count	% of Total	Count	% of Total IBC	% of Rating Category
Overweight	72	37%	44	33%	61%
Equal-weight	77	40%	58	44%	75%
Underweight	44	23%	31	23%	70%
Total	193		133		

*Coverage includes all companies that we currently rate. Investment Banking Clients are companies from whom Morgan Stanley or an affiliate received investment banking compensation in the last 12 months.*

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**Overweight (O)** Over the next 6 months, the fixed income instrument's total return is expected to exceed the average total return of the relevant benchmark, as described in this report, on a risk adjusted basis.

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